

Claims

1. A smallpox vaccine virus undergoing with difficulty reverse mutation that induces production of a B5R gene product having normal functions, which is a smallpox vaccine being deficient in a part or the whole of a B5R gene of a 5 vaccinia virus LC16 strain, LC16m8 strain, or LC16mO strain and consisting of a vaccinia virus that produces no B5R gene products having normal functions.
2. The smallpox vaccine virus according to claim 1, which is completely deficient in the B5R gene.
- 10 3. The smallpox vaccine virus according to claim 1 or 2, which is deficient in a part of the B5R gene and produces no B5R gene expression products having normal functions.
4. The smallpox vaccine virus according to any one of claims 1 to 3, wherein plaque sizes resulting from infection of RK13 cells with the virus and 15 subcutaneous proliferation property resulting from administration of the virus to a rabbit are equivalent to those of the LC16m8 strain.
5. The smallpox vaccine virus according to any one of claims 1 to 4, which is deficient in a part of the B5R gene, wherein a promoter is ligated upstream of the B5R gene and a part of the B5R gene is expressed, but the expression 20 product lacks the normal functions of a B5R gene expression product.
6. The smallpox vaccine virus according to any one of claims 3 to 5, which is deficient in a transmembrane domain of the B5R gene.
7. The smallpox vaccine virus according to claim 5 or 6, wherein the promoter is PSFJ1-10, PSFJ2-16, or another high expression promoter for poxvirus.
- 25 8. A smallpox vaccine virus, which consists of a vaccinia virus deficient in the whole or a part of a transmembrane domain of a B5R gene.
9. The smallpox vaccine virus according to claim 8, wherein a promoter is

ligated upstream of the B5R gene and a part of the B5R gene is expressed, but the expression product lacks the normal functions of a B5R gene expression product.

10. The smallpox vaccine virus according to claim 8 or 9, wherein the promoter is PSFJ1-10, PSFJ2-16, or another high expression promoter for poxvirus.
11. A smallpox vaccine pharmaceutical composition, which contains the smallpox vaccine virus according to any one of claims 1 to 10.
12. A vaccinia virus vector undergoing with difficulty reverse mutation that induces production of a B5R gene product having normal functions, which is a vaccinia virus vector being deficient in a part or the whole of a B5R gene of a vaccinia virus LC16 strain, LC16m8 strain, or LC16mO strain and producing no B5R gene products having normal functions.
13. The vaccinia virus vector according to claim 12, which is completely deficient in the B5R gene.
14. The vaccinia virus vector according to claim 12 or 13, which is deficient in a part of the B5R gene and produces no B5R gene expression products having normal functions.
15. The vaccinia virus vector according to any one of claims 12 to 14, wherein plaque sizes resulting from infection of rabbit kidney cells with the vector and subcutaneous proliferation property resulting from administration of the vector to a rabbit are equivalent to those of the LC16m8 strain.
16. The vaccinia virus vector according to any one of claims 12 to 15, which is deficient in a part of the B5R gene, wherein a promoter is ligated upstream of the B5R gene and a part of the B5R gene is expressed, but the expression product lacks the normal functions of a B5R gene expression product.
17. The vaccinia virus vector according to any one of claims 12 to 16, which

is deficient in a transmembrane domain of the B5R gene.

18. The vaccinia virus vector according to claim 16 or 17, wherein the promoter is PSFJ1-10, PSFJ2-16, or another high expression promoter for poxvirus.

5 19. A vaccinia virus vector, which is deficient in the whole or a part of a transmembrane domain of a B5R gene.

20. The vaccinia virus vector according to claim 19, wherein the promoter is ligated upstream of the B5R gene and a part of the B5R gene is expressed, but the expression product lacks the normal functions of a B5R gene expression 10 product.

21. The vaccinia virus vector according to claim 19 or 20, wherein the promoter is PSFJ1-10, PSFJ2-16, or another high expression promoter for poxvirus.

22. The vaccinia virus vector according to any one of claims 12 to 21, which 15 contains a foreign gene.

23. The vaccinia virus vector according to claim 22, wherein the foreign gene is an antigen of a virus, a bacterium, a protozoan, or cancer.

24. A vaccine virus pharmaceutical composition for a virus, a bacterium, a protozoan, or cancer, which contains the vaccinia virus vector according to 20 claim 23.